**Berner Fachhochschule**
**Haute école spécialisée bernoise**
**Bern University of Applied Sciences**

# Bachelor Thesis Module

# Research Question & Research Design
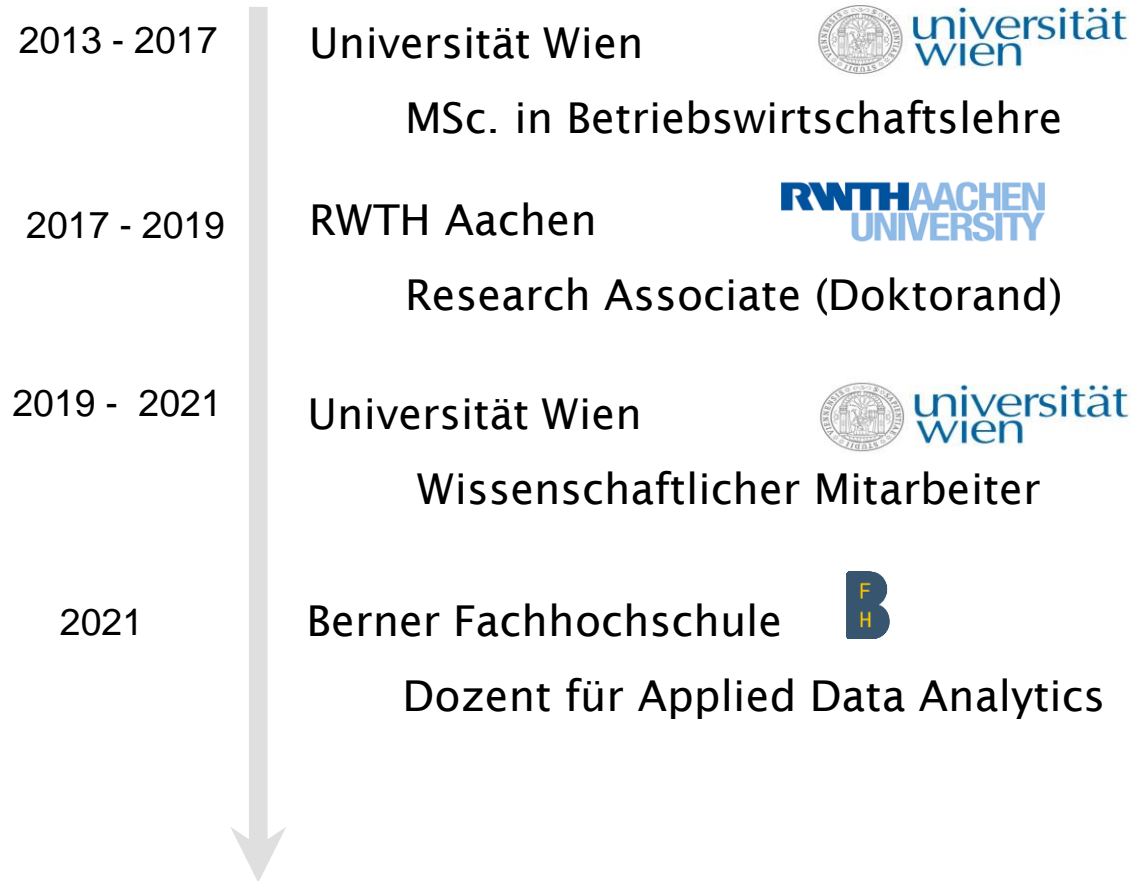
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gernot.pruschak@bfh.ch

▶ Institute for Applied Data Science, Business School

# Agenda

| Agenda |
|:---:|
| Introduction to Workshop |
| Introduction to Social Sciences |
| Reasons for Asking a Research Question |
| Generation of a Research Question |
| Exercise: Generating a Research Question |
| Research Design |

# Introduction to Workshop

# CV – Gernot Pruschak

Email:
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2013 - 2017    Universität Wien

    MSc. in Betriebswirtschaftslehre

2017 - 2019    RWTH Aachen

    Research Associate (Doktorand)

2019 - 2021    Universität Wien

    Wissenschaftlicher Mitarbeiter

2021    Berner Fachhochschule

    Dozent für Applied Data Analytics

# Goal of Workshop

▸ Students' topic requests and submissions for Bachelor thesis often contain very vague concepts

  ▸ E.g., "I would like to write my Bachelor Thesis on the topic of social media marketing"

▸ More specific requests helpful

  ▸ More profound feedback for students

  ▸ Better fitting supervision for lecturers

▸ Workshop aims at helping you to

  ▸ Formulate more specific research questions

  ▸ Understand the wide spectrums of research designs available to investigate the research question

# Introduction to Social Sciences

# Types of Sciences
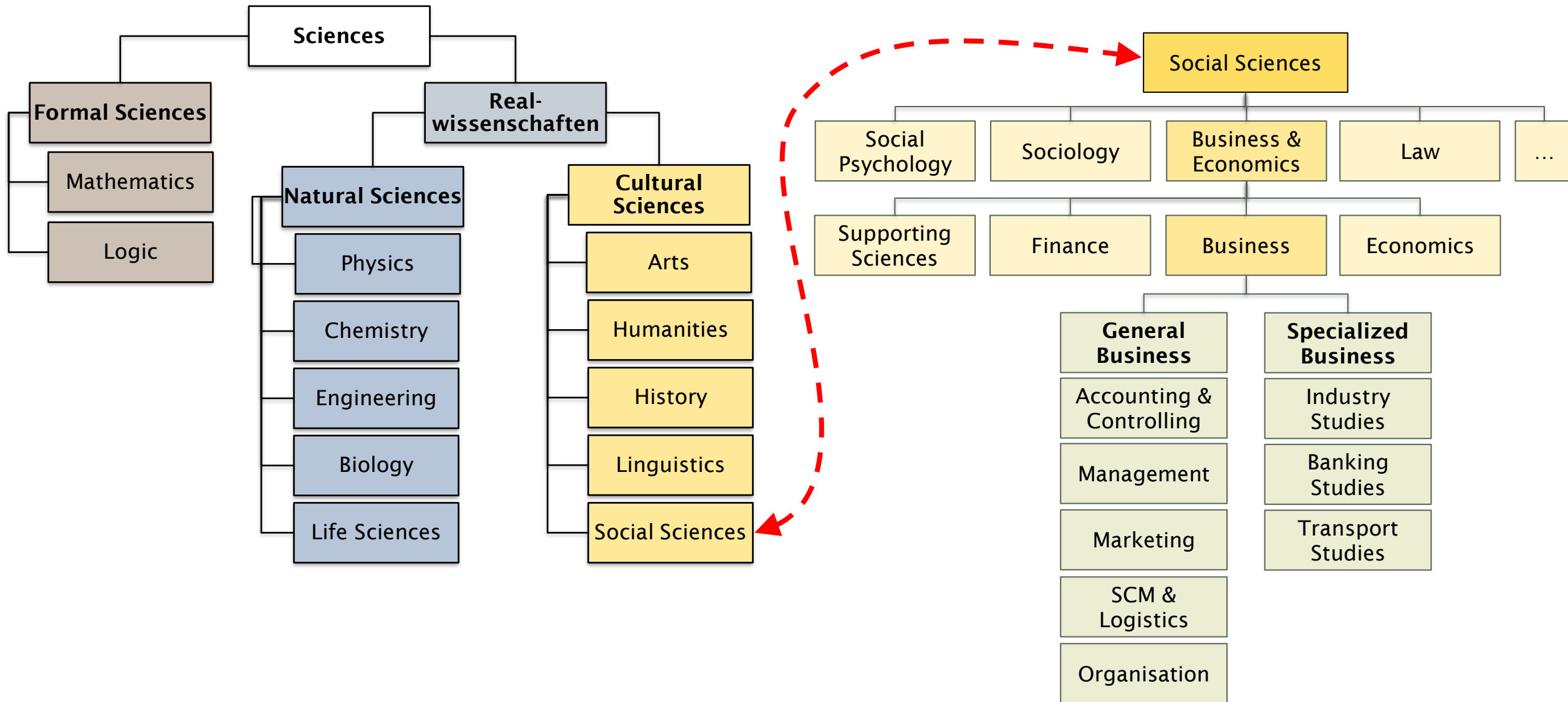
# What is empirical social scientific research?

**empirical (Greek)** = «based on experience»

▸ Empirical social scientific research
    ▸ collects and interprets data about **social facts**

    ▸ Employs methods for **measuring** and **describing** real phenomena that we can experience

    ▸ allows us to make **statements about** the **real world**

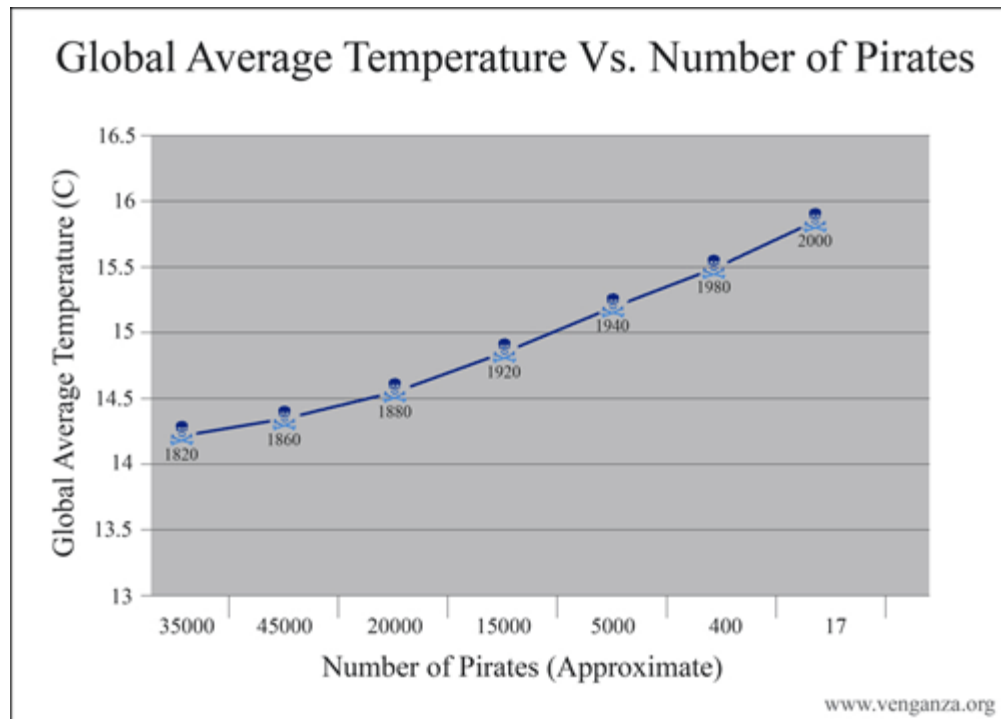    ▸ **satisfies scientific standards:** Comprehensiveness, Transparency and Reproducibility

# Goal of the Social Sciences

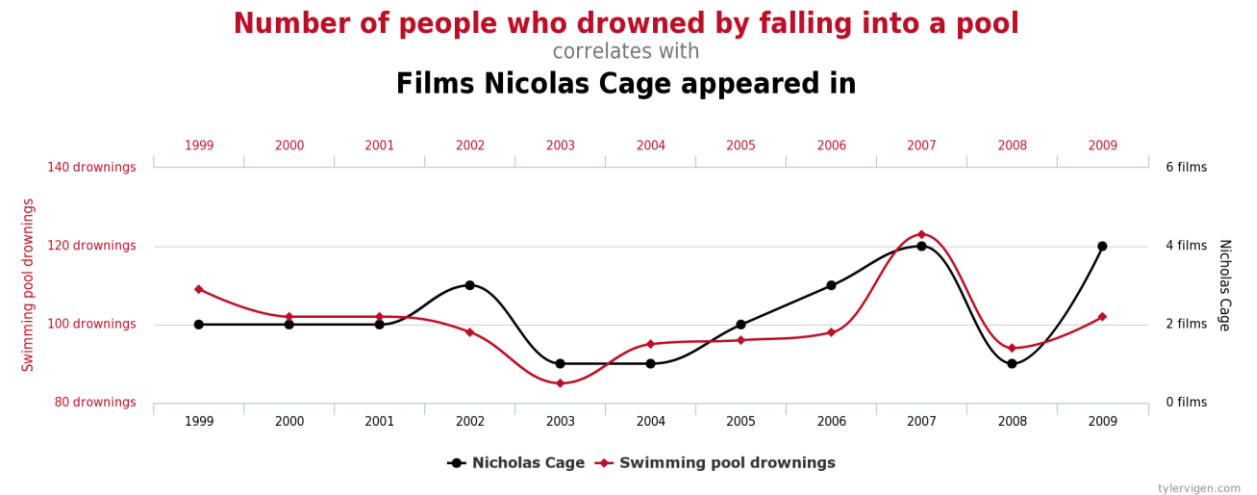Social Sciences want to describe, explain, predict and change **human experiences, behaviors and actions.**

▸ **Describe**: Classification, Typology, Definition and comprehend relationships

▸ **Explain**: Describe causal effects (≠ statistic correlation)
  ▸ Describe and explain require different methods

# Correlation ≠ Causation

## Pirates and Global Warming
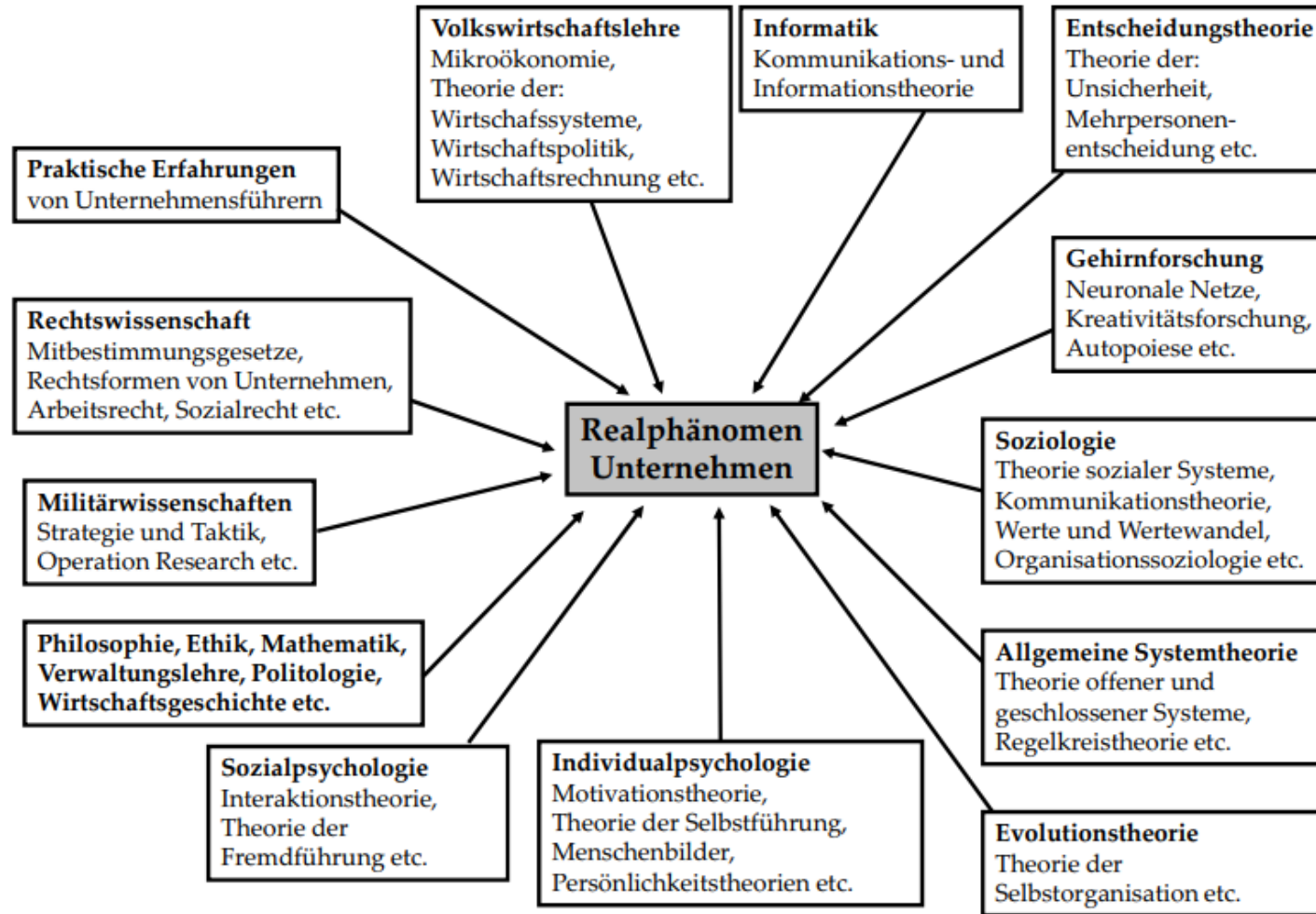


## People drowned in pools and Nicolas Cage movies

# Goal of the Social Sciences

Social Sciences want to describe, explain, predict and change **human experiences, behaviors and actions.**

- **Describe**: Classification, Typologie, Definition and comprehend relationships

- **Explain**: Describe causal effects (≠ statistic correlation)
  - Describe and explain require different methods

- **Predict**: Describe future experiences / behaviors

- **Induce change** through management and impact (Marketing, Organizational Development)

# Relevance of «neighbouring» sciences and supporting sciences



**Volkswirtschaftslehre**
Mikroökonomie,
Theorie der:
Wirtschafssysteme,
Wirtschaftspolitik,
Wirtschaftsrechnung etc.

**Informatik**
Kommunikations- und
Informationstheorie

**Entscheidungstheorie**
Theorie der:
Unsicherheit,
Mehrpersonen-
entscheidung etc.

**Praktische Erfahrungen**
von Unternehmensführern

**Rechtswissenschaft**
Mitbestimmungsgesetze,
Rechtsformen von Unternehmen,
Arbeitsrecht, Sozialrecht etc.

**Gehirnforschung**
Neuronale Netze,
Kreativitätsforschung,
Autopoiese etc.

**Realphänomen Unternehmen**

**Soziologie**
Theorie sozialer Systeme,
Kommunikationstheorie,
Werte und Wertewandel,
Organisationssoziologie etc.

**Militärwissenschaften**
Strategie und Taktik,
Operation Research etc.

**Allgemeine Systemtheorie**
Theorie offener und
geschlossener Systeme,
Regelkreistheorie etc.

**Philosophie, Ethik, Mathematik,
Verwaltungslehre, Politologie,
Wirtschaftsgeschichte etc.**

**Sozialpsychologie**
Interaktionstheorie,
Theorie der
Fremdführung etc.

**Individualpsychologie**
Motivationstheorie,
Theorie der Selbstführung,
Menschenbilder,
Persönlichkeitstheorien etc.

**Evolutionstheorie**
Theorie der
Selbstorganisation etc.

Quelle: Bardmann 2011, S.55, Abb. 7
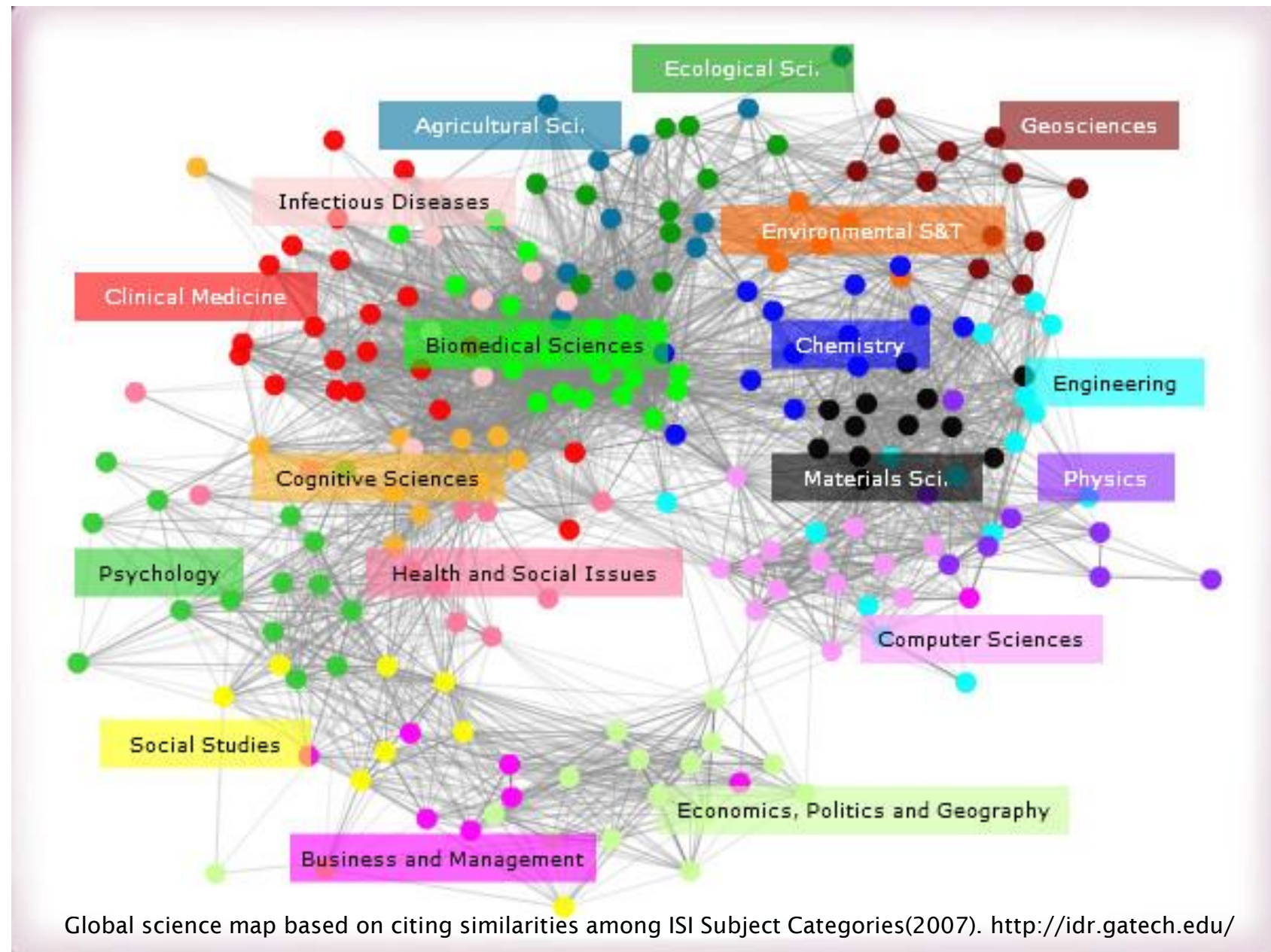
# Interdisciplinarity

**Global citation map**
Rafols, Porter & Leydesdorff, School of Public Policy, Georgia Institute of Technology, University of Sussex (2007)

References:
Porter, A., Cohen, A.S., Roessner, J.D., Perreault, M. (2007). Measuring researcher interdisciplinarity. In: Scientometrics 72(1), p. 117-147.
DOI: 10.1007/s11192-007-1700-5

Rafols, I. and Meyer, M. (2010). Diversity and network coherence as indicators of interdisciplinarity: case studies in bioanoscience. In: Scientometrics 82, p. 263-287. DOI 10.1007/s11192-009-0041-y

Global science map based on citing similarities among ISI Subject Categories(2007). http://idr.gatech.edu/

# Generation of (social scientific) knowledge



## Authorities

Information is valid because we gathered it from a **source** that we perceive as competent and reliable.

**Boss**

**Professor**

**Doctor**

**Etc.**

Knowledge can be incomplete or biased

## Inference

Logic and Rationality

*Train travel produces less CO2 than air travel for the same travel distance*

*Gernot travels by plane*

Logic per se is immaculate
Yet the conclusion depends upon the truth of the initial proposition

## Experience

Learning via observations or experiences and reflection upon them

Our experiences are inevitably bounded and our interpretations are susceptible to distortions

**Concept of Falsifiability**

# How does the scientific method overcome these errors?



Determinism

Publications of Findings

Data-based Inferences

Generation of preliminary/temporary „truths"

Development of falsifiable theories

# Reasons for a Research Question

# Why do we ask Research Questions?

→ This course is completely useless. No one in practice asks research questions. This has no practical relevance. BFH gets it (like always) completely wrong. The Dozierende have no f&!%&?! clue what is happening in practice!!!

Let's Check:

A Research Question: Do women earn less than men?

1) Very sensible, interesting, theoretically, and (potentially) even practically relevant

"gender pay gap"

About 42.200 results (**0,09** sec)

COMPANY ANNOUNCEMENTS

## Ensuring we pay fairly and equitably

Mar 04, 2019  ·  1 min read

**L** Lauren Barbato
Lead Analyst for Pay Equity, People Analytics

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# How do we answer such a RQ

*Table 1.* Overview of Wage Inequality Trends, 1979, 1989, and 1998.

| Inequality Indicators | 1979 | 1989 | 1998 | Changes (Average Annual Change × 10) | |
| --- | --- | --- | --- | --- | --- |
| | | | | 1979–89 | 1989–98 |
| **Men** | | | | | |
| Std. Dev. of Log Wage | 0.506 | 0.569 | 0.601 | 0.063 | 0.036 |
| 90–50 Differential | 0.516 | 0.630 | 0.761 | 0.114 | 0.145 |
| 50–10 Differential | 0.654 | 0.787 | 0.700 | 0.133 | −0.096 |
| Sample Size | 2816 | 2894 | 2336 | — | — |
| **Women** | | | | | |
| Std. Dev. of Log Wage | 0.484 | 0.543 | 0.566 | 0.060 | 0.026 |
| 90–50 Differential | 0.603 | 0.646 | 0.675 | 0.043 | 0.031 |
| 50–10 Differential | 0.534 | 0.719 | 0.696 | 0.186 | −0.025 |
| Sample Size | 1922 | 2290 | 1804 | — | — |
| Gender Log Wage Differential | 0.459 | 0.295 | 0.227 | −0.164 | −0.075 |
| Implied Female/Male Pay Ratio | 0.632 | 0.745 | 0.797 | 0.113 | 0.058 |
| Mean Female Percentile in the Male Wage Distribution[a] | 24.31 | 35.16 | 38.93 | 10.85 | 4.19 |

Blau, F. D., & Kahn, L. M. (2006). The US gender pay gap in the 1990s: Slowing convergence. *Ilr Review*, *60*(1), 45-66.

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# Variants of the same RQ

▸ An alternative RQ
  ▸ What predicts the gender pay gap?
  ▸ Here we look for factors that might predict whether the difference between men and women becomes larger

▸ Importantly, we need to derive our predictions theoretically (or through qualitative analysis)

▸ Several ways of going about it
  ▸ Theory-driven quantitative analysis
  ▸ Qualitative analysis (to derive testable predictions)
  ▸ Experimental analysis

# Practical Example



TECHNOLOGY

## Google Pay Study Finds It Underpaid Men For Some Jobs

March 5, 2019 · 7:32 AM ET

MATTHEW S. SCHWARTZ

# What Google does

**How we run our pay equity analysis at Google**

To ensure we can produce results that translate to meaningful action, we run our analyses at the job code level, adjusting for job function and level. Here's how it works:

- At the end of our annual compensation planning process (for salary, bonus, and equity) we ran rigorous statistical analyses to check the outcomes before any amounts were final. We conducted separate ordinary least squares (OLS) regressions to check for pay equity in each job group—a job group is made up of job family (like Software Engineer) and level (like Level 4).
- The OLS method allows us to account for factors that should influence pay (e.g., tenure, location, performance ratings) and look for unexplained differences in total compensation (salary, bonus, and equity) across demographic groups. Specifically, we looked for pay differences based on gender (for which we have information worldwide) and, in the U.S., by race/ethnicity.
- Our analyses covered every job group with at least 30 Googlers total and at least five Googlers per demographic group for which we have data (e.g., at least five men and at least five women). These n-count minimums ensure statistical rigor (e.g., higher statistical power, narrower confidence intervals)

# Problem

▶ But here comes the problem: Google runs these regressions separately for specific groups of employees, based on their job level and function. They do this to avoid comparing 🍎 with 🍏. And why wouldn't you
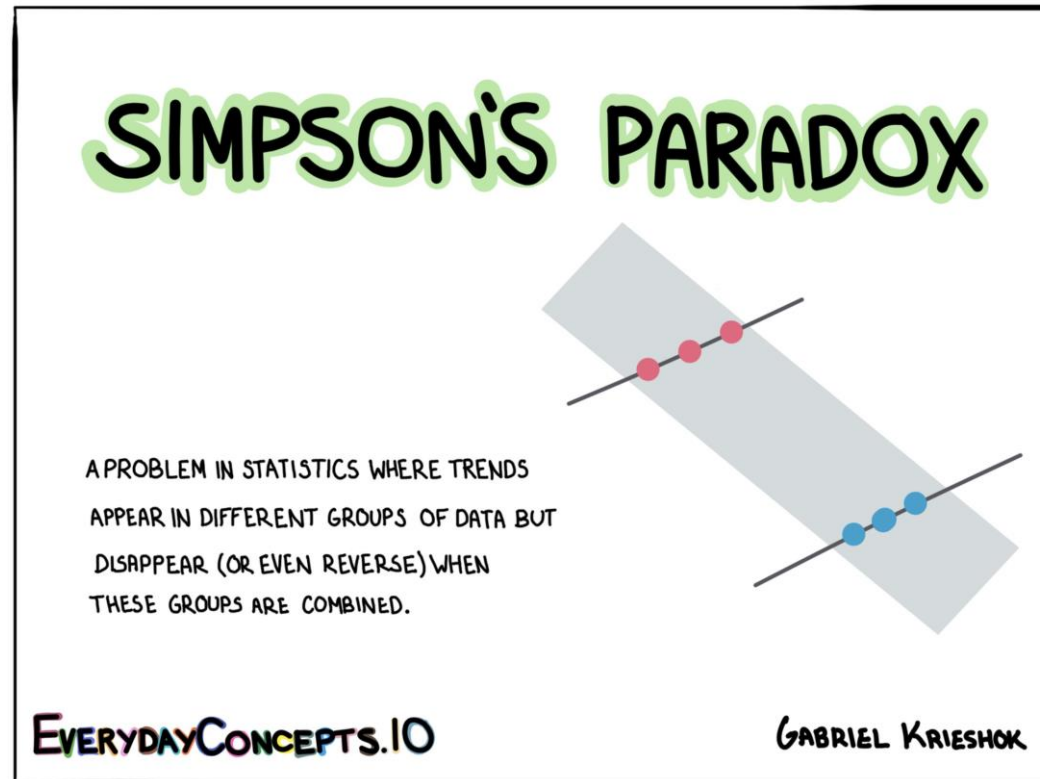
# Explanation

▶ It could very well be that women are overall paid less at an organization like Google, but if you adjust for a third variable like job level or function, the sign flips and suddenly you get the exact opposite direction for the relationship.

▶ The intuition here is that women have more obstacles to overcome to make it to higher-level positions. Those women that make it nonetheless are often a specifically selected group with likely higher skills than average. This higher skill level pushes their annual pay (self-selection or survivorship bias)
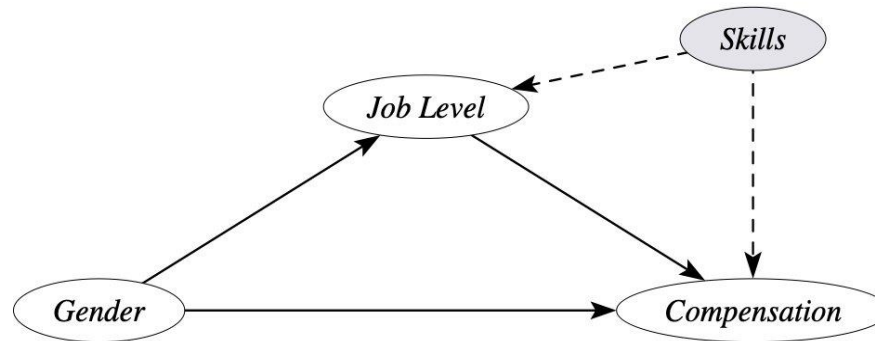


▶ So especially in groups with higher seniority you will find women that consistently over performed throughout their career to make it this far. It is therefore not surprising that they might also receive, e.g., higher bonuses than their male peers.

# Generation of a Research Question

# Every research starts with a question ...

How do I find the answers to improve my performance and make life better für customers, employees and owners?

# Buidling Questions

Ask a question?
Give an answer!

Ask a question?
- What have others already asked and answered?
- What is the actual context?
- How can I find an answer?
- How to measure/collect data?

Give an answer!
- Is it possible to answer the question?
- What could happen? What has happened?
- What are the findings?
- What is the meaning of the findings?
- What have others found?

in all directions

Think it through !

# Good Scientific Questions

A testable Question can be answered conducting interviews, experiments, surveys, …

- ▸ Does yoghurt X have more sugar than yoghurt Y?
- ▸ What is the effect of sports on life expectancy?

A Non-Testable Question cannot be answered by conducting interviews, experiments, surveys, …

- ▸ Why does sugar taste the best in the world?

a good question leads to more questions!

# Good research questions

▸ **testable** "Why is that a business?" **better:** "What are the components of a business?"

▸ **measurement** "Where do crops come from?" **better:** "How will the amount of crop per acer change, when the water is reduced by 20%?"

▸ **knowledge** "Will fertilizer make crops grow larger?" **better:** "What types of fertilizer will make crops grow larger?"

# It always helps to ask a question!

▸ When you are getting your findings, you should at least also consider it carefully and argue properly to add it into your understanding
   ▸ Theoretical and practical arguments should support your findings
   ▸ Counter-intuitive results are great -> Explain mechanism
      ▸ Ig-Nobel Prize for Management 2010:
         ▸ The Peter Principle Revisited: A Computational Study (Pluchino et al., 2009)
         ▸ For „Demonstrating mathematically that organizations would become more efficient if they promoted people at random."

# High school leadership – Question

**Find the topic**…

▸ How do leaders develop?

▸ Do leaders already emerge in adolescence?

▸ Does high school leadership predict wages?

**Check:** what are possible answers?

Am I satisfied with this answer?

No, refine question.

Yes, (maybe).

**clarify – what exactly?**

▸ High school = adolescents between grade 10 and grade 12

▸ High school leadership = team captain, club president

▸ Wages = income several years after high school graduation

# High school leadership– Factors to deal with

- Timing of the measures?
  - When to measure? (leadership, wages)
  - How long (e.g. average yearly wage, monthly wage)?
- Leadership dimensions?
  - Only leadership in high school club/teams?
  - Leadership in leisure activities?
  - Vice-captains, vice-presidents?
- Context
  - Geographical region (e.g. Northern America vs. Europe)
  - Gender differences
- Data analysis
  - How to analyze the data?
  - How to categorize the data?

- large number of decisions
- improve iteratively
- read other peoples work
- try it out

# Example: Young Managers in Digital Firms

# Young Managers in Digital Firms

▸ Observation: Successful digital firms have comparably young managers



38 Jahre



35 Jahre

▸ How could a research question look like for studying this phenomenon?

# Build a research question

- In groups of 3-4

- You have 5 minutes to build a research question on this observation
  - Fill out <u>template slide</u>

- Afterwards upload your slide <u>in OneDrive</u>

- Presentations of RQs

# Young managers in digital firms

▸ 1st RQ: Do digital firms with young managers perform better?

▸ Clarification of terms

  ▸ Digital firms: NASDAQ

  ▸ Young managers: CEOs age

  ▸ Perform better: Stock market returns

▸ Final RQ: Does the age of the CEO affect the stock market returns from firms listed in the NASDAQ?

# Research Design

# 3 Types of Research Design
## (Hair 2015, 133-159)

**Exploratory Research**

- … is used to develop a better understanding of a business problem or opportunity
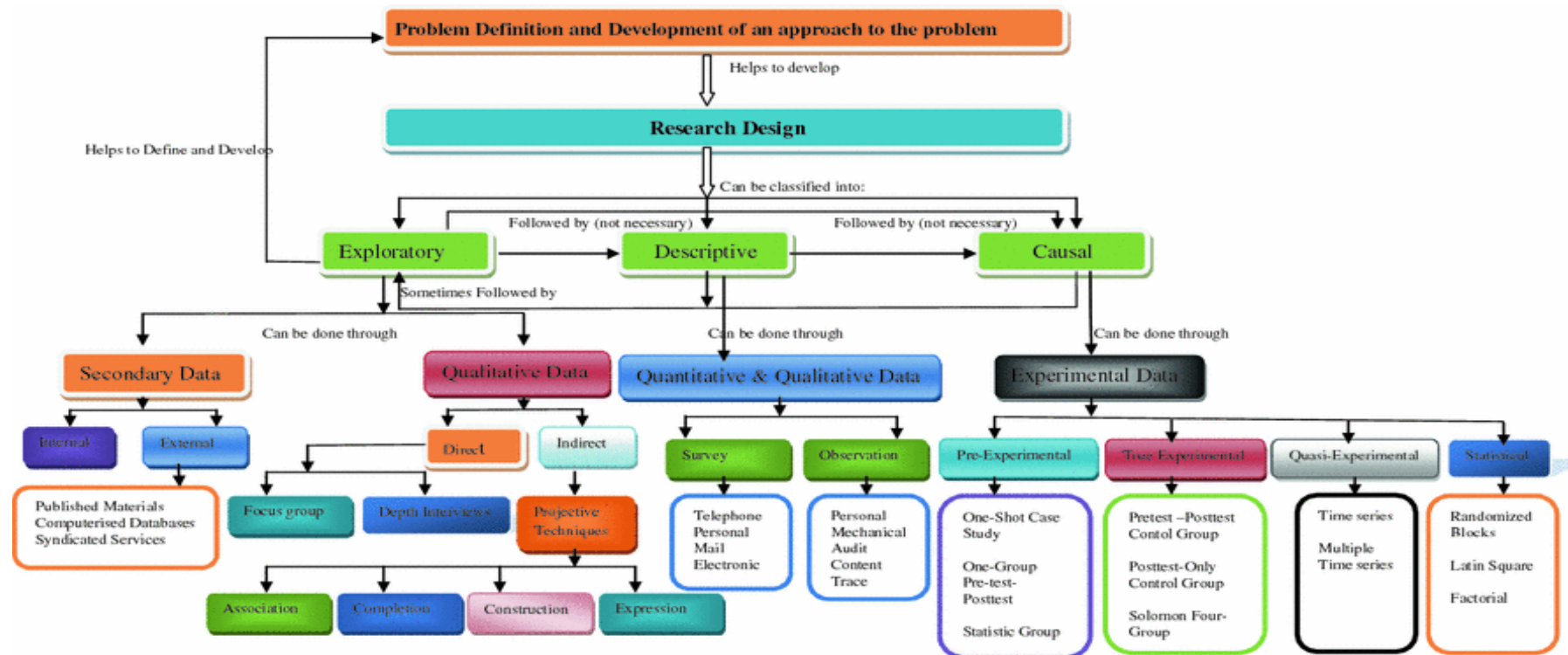
**Descriptive Research**

- … describes a situation.

**Causal Research**

- One event causes another.

# Business Research Design (Sreejesh 2014, 29)

# Exploratory Research

▸ Exploratory research is carried out to make problems suited to more precise investigation by **generating a theoretical model** from an operational perspective.

▸ Exploratory studies help in understanding and assessing the critical issues of problems.

▸ It is not used in cases where final results are desired.

▸ The study results are used for subsequent (causal) research to attain conclusive results for a particular problem situation.

# Exploratory Research

▶ Exploratory studies are conducted for three main reasons

1. to analyze a problem situation
2. to develop theoretical models
3. to derive research propositions.

▶ Research propositions state a possible causal relationship between two phenomena
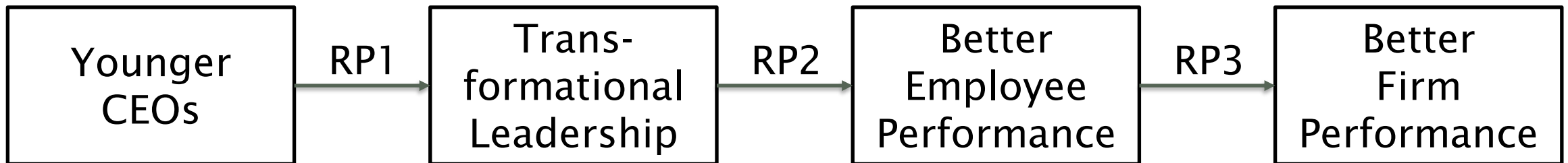   ▶ X might cause Y
   ▶ Tested through causal research

# Exploratory Research

▸ Example
  - ▸ We are not only interested in the job market aspects but also whether younger and older CEOs differ in their approach towards leadership
  - ▸ Leadership literature shows that this can embrace numerous facets
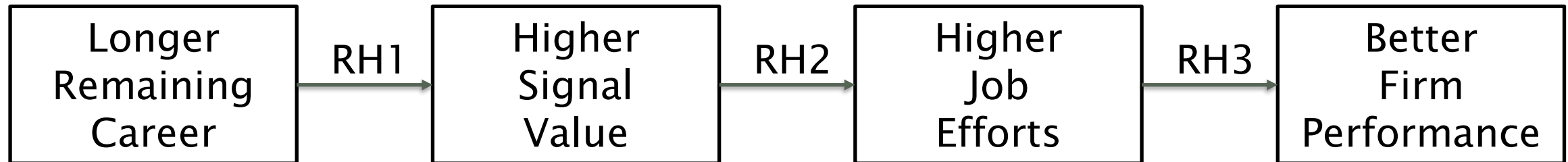  - ▸ To identify relevant leadership differences, we conduct exploratory research

▸ Study Result

```
┌──────────────┐       ┌──────────────┐       ┌──────────────┐       ┌──────────────┐
│              │  RP1  │    Trans-    │  RP2  │    Better    │  RP3  │    Better    │
│   Younger    │ ────> │  formational │ ────> │   Employee   │ ────> │     Firm     │
│    CEOs      │       │  Leadership  │       │  Performance │       │  Performance │
└──────────────┘       └──────────────┘       └──────────────┘       └──────────────┘
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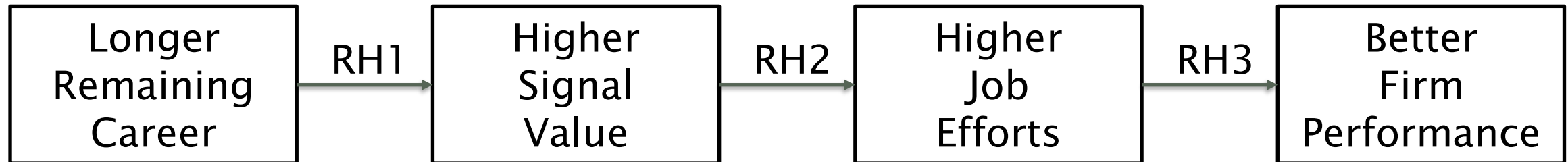
# Causal Research

▸ … tests whether one event causes another. A causal relationship means that a change in one event brings about a corresponding change in another event.

▸ Derivation of causal relationship from theory through theoretical models

▸ Testable causal relationships manifested in research hypotheses
  ▸ RH: An increase/decrease in X leads to an increase/decrease in Y

▸ Example

| Longer Remaining Career | RH1 → | Higher Signal Value | RH2 → | Higher Job Efforts | RH3 → | Better Firm Performance |

# Causal Research

▶ Null-Hypothesis-Significance-Testing
  ▶ Postulate Null-Hypothesis (H0) (no relationship)
  ▶ Alternative Hypothesis (H1) (relationship)
  ▶ Investigate whether we can reject H0 -> Assume H1 to be "true"

▶ Example for RH3
  ▶ H0: No effect between CEO Job Effort and Better Firm Performance
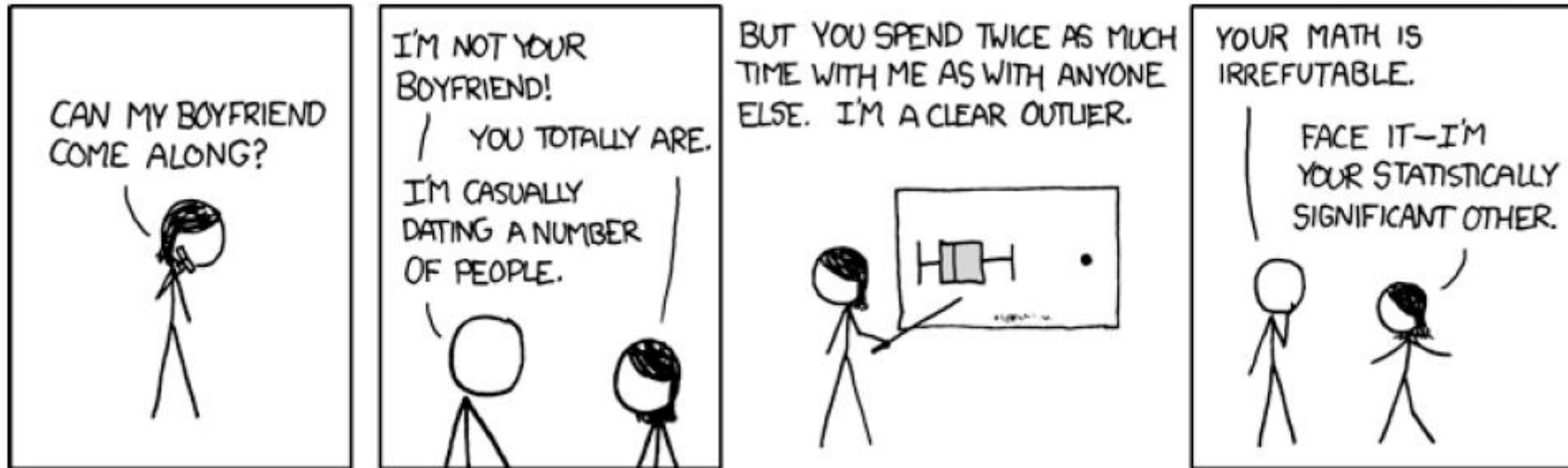  ▶ H1: Effect between CEO Job Effort and Better Firm Performance

# Causal Research

- Rejection of H0
  - "We can reject H0 with the probability $\alpha$"
  - Standard: $\alpha = 95\%$
  - p-value = 100% - $\alpha$

- **IMPORTANT**
  - We can **NEVER** confirm H0!



- More information in quantitative methods workshop
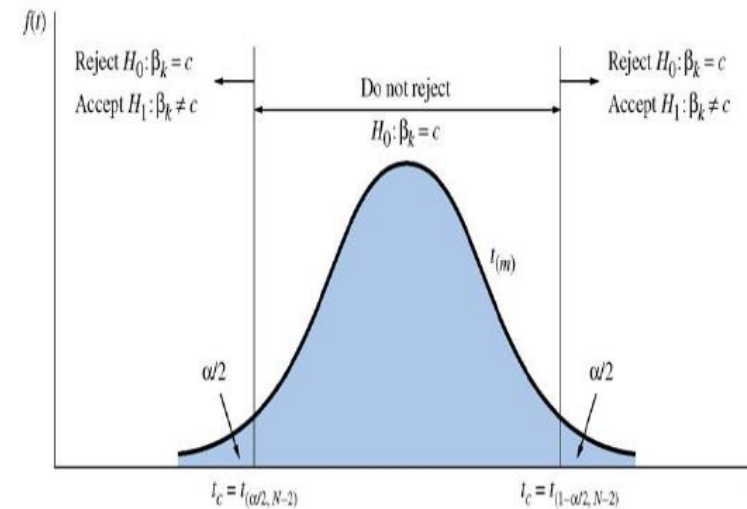
# Causal Research

# Causal Research

▶ There are four conditions researchers look for in testing cause-effect relationships.

1. Theoretical support – a logical explanation exists for why the cause and effect relationship exists.

2. Time sequence – the cause must occur before the effect

3. Covariance – a change in the cause is associated with a change in the effect (2 variables are related to another)

4. Nonspurious association – the relationship is true and not due to something else that just happens to affect both the cause and the effect. This requires that other potential causes be controlled and eliminated.

# Summary Exploratory vs. Causal Research

- Exploratory research for obtain theoretical models as proper foundations for conducting causal research later.
  - Input: Existing research and concepts for related phenomena
  - Result: Theoretical models and research propositions

- Causal research for testing theoretical models
  - Input: Theoretical model and research hypotheses
  - Result: (Non-)rejection of research hypotheses

# Questions?



In case of Questions regarding Research Question, Literature Search and Research Design please just reach out to me via: <u>gernot.pruschak@bfh.ch</u>